FEMA 209:120319

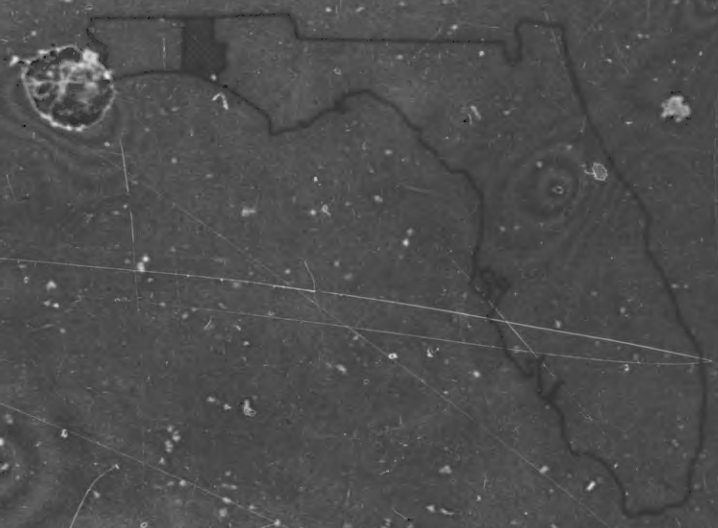
FLOOD INSURANCE STUDY

23 COMPLETED

ORIGINAL

CITY OF FREEPORT, FLORIDA

WALTON COUNTY



APRIL 30, 1980

Federal Emergency Management Agency

COMMUNITY NUMBER 120319

BEST COPY AVAILABLE

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
1.1	Purpose of Study	1
1.2	Authority and Acknowledgments	1
1.3	Coordination	2
2.0	AREA STUDIED	2
2.1	Scope of Study	2
2.2	Community Description	2
2.3	Principal Flood Problems	2
2.4	Flood Protection Measures	6
3.0	ENGINEERING METHODS	6
3.1	Hydrologic Analyses	7
3.2	Hydraulic Analyses	10
4.0	FLOOD PLAIN MANAGEMENT APPLICATIONS	10
4.1	Flood Boundaries	10
5.0	INSURANCE APPLICATION	11
5.1	Reach Determinations	11
5.2	Flood Hazard Factors	11
5.3	Flood Insurance Zones	11
5.4	Flood Insurance Rate Map Description	12

BEST COPY AVAILABLE

TABLE OF CONTENTS (Continued)

		Page
6.0	OTHER STUDIES	12
7.0	LOCATION OF DATA	12
8.0	REFERENCES AND BIBLIOGRAPHY	14

FIGURES

Figure	1	-	Vicinity Map	3
Figure	2	-	Historical Storm Tracks	5

TABLES

Table	1	-	Parameter Values for Surge Elevations	8
Table	2	-	Summary of Stillwater Elevations	9
Table	3	-	Coastal Flood Insurance Zone Data	13

EXHIBIT

Flood Insurance Rate Map

BEST COPY AVAILABLE

FLOOD INSURANCE STUDY

CITY OF FREEPORT,
WALTON COUNTY,
FLORIDA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Freeport, Walton County, Florida, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound flood plain management. Minimum flood plain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

This Flood Insurance Study was prepared by compiling existing hydrologic and hydraulic technical and scientific data prepared by the Federal Emergency Management Agency (FEMA) for purposes of the National Flood Insurance Program. The data were identified as the best available at the time of compilation of this Flood Insurance Study and should depict the general conditions of the flooding sources with relative accuracy. FEMA performed a cursory review and accepted the data as valid for purposes of this Flood Insurance Study and the National Flood Insurance Program. However, if better information is known to exist or has been developed since the date of this report, the information should be immediately forwarded to the Natural and Technological Hazards Division, Federal Emergency Management Agency, Atlanta, Georgia, for consideration for revision of this study.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were obtained from the Type 19 Flood Insurance Study for the Unincorporated Areas of Walton County, Florida (Reference 1).

BEST COPY AVAILABLE

1.3 Coordination

On June 10, 1985, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the community and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Freeport, Walton County, Florida. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected based upon the extent and validity of available existing hydrologic and hydraulic data. A detailed coastal flooding analysis was performed for the City of Freeport, where the flooding source is Choctawhatchee Bay.

Approximate methods of analysis were used to study all remaining areas having a potential flood hazard that did not have detailed scientific or technical data available.

2.2 Community Description

The City of Freeport is located in south-central Walton County, in the northwestern Florida Panhandle. It is completely surrounded by the unincorporated areas of Walton County. The city is approximately 7 miles due south of the City of DeFuniak Springs, which is the county seat. Freeport is located just southeast of Eglin Air Force Base and shares its northern boundary. Major highways that provide transportation in Freeport include U.S. Route 331, State Road 20, and County Highway 83A. The population of the City of Freeport was reported to be 669 in 1980 (Reference 2).

The climate of Freeport is subtropical, with a moderating influence from the Gulf of Mexico. The average daily temperature varies during the year from 55 degrees Fahrenheit (F.) to 82 degrees F. The average annual precipitation is approximately 58 inches.

2.3 Principal Flood Problems

The main flood problems in the city can be attributed to tidal surge. Some of the worst floods to occur in northwestern Florida were the result of high intensity rainfall during hurricanes. The time of concentration of runoff for large basin rivers in northwestern Florida may be several days; consequently, peak flows do not, as a rule, coincide with hurricane tides at the coast. The small streams, however, have a shorter period for concentration of runoff and the floodflow occurring concurrently with the storm surge is more likely. This greatly increases the likelihood of inundation of low-lying areas along the coast. The maximum rainfall ordinarily occurs in the eastern half of the storm system. As the storm passes inland, its intensity decreases but heavy rainfall continues. Total precipitation of 12 inches recorded at a single station during a hurricane is not uncommon, and in northwestern Florida, rainfall has been as high as 24 inches for the duration of the storm (Reference 3).

BEST COPY AVAILABLE

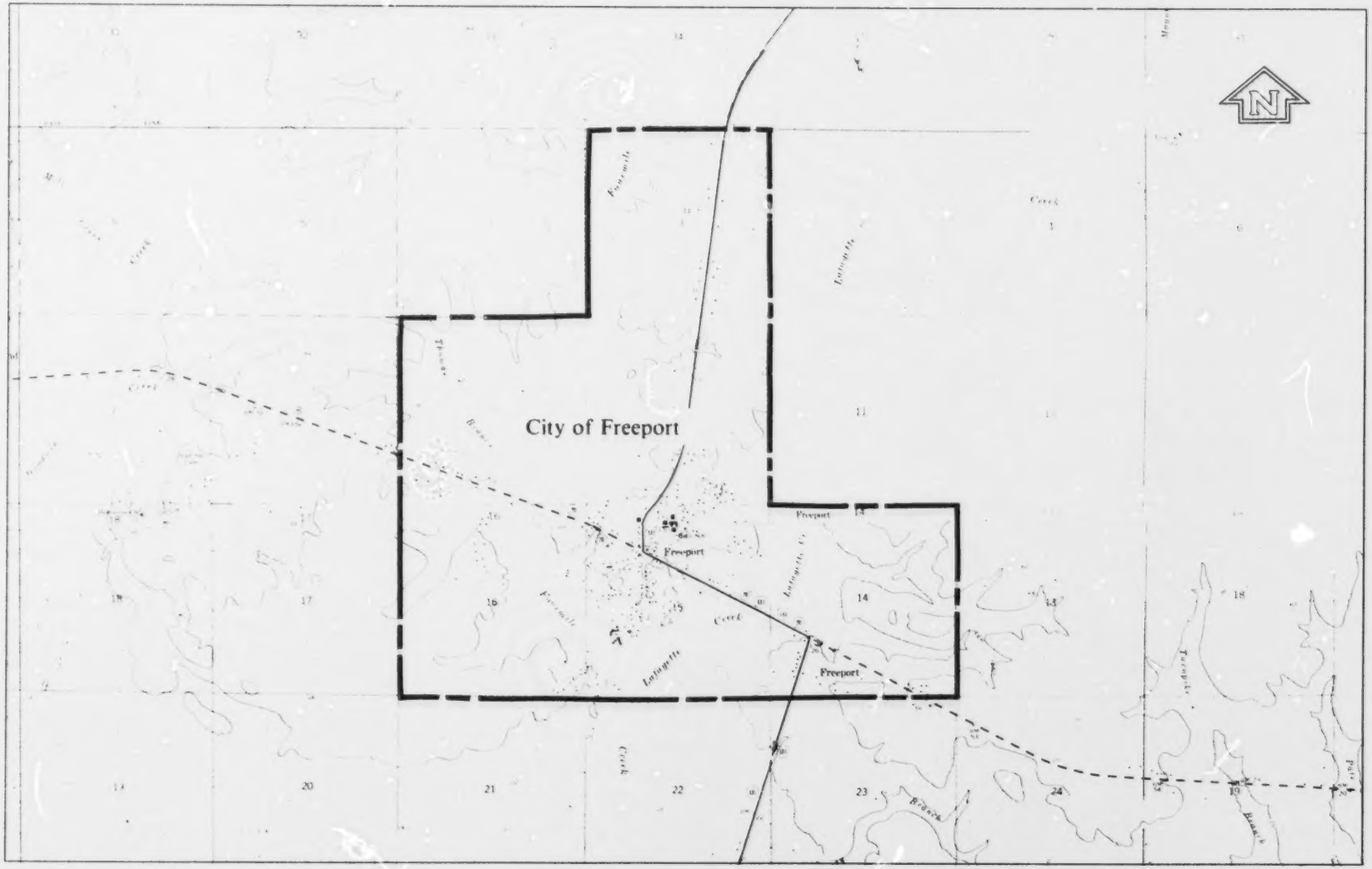


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF FREEPORT, FL

(WALTON CO.)

APPROXIMATE SCALE

4000 0 4000 8000 12000 FEET

VICINITY MAP

BEST COPY AVAILABLE

Normal rainfall patterns are greatest during two distinct periods: 1) during summer due to afternoon and evening thunderstorms, and 2) during late winter and early spring due to frontal systems.

The City of Freeport is subject to flooding from tidal surges associated with hurricanes both along the Gulf of Mexico and inside Choctawhatchee Bay. Generally, the terrain inland along Choctawhatchee Bay rises fairly rapidly and the flooding from surges is restricted to only short distances behind the bay.

Figure 2 shows the tracks of hurricanes affecting the Florida Panhandle from 1877 to 1975.

The basic information on hurricane tracks was taken from the maps of North Atlantic tropical cyclone tracks for the years 1871 through 1977, compiled by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA) (Reference 4). Brief notes on the history and damages caused by hurricanes are abstracted from reports by the U.S. Army Corps of Engineers (References 5 and 6), Garriott (Reference 7), Sumner (Reference 8), and Patterson, Bailey, and Paulhus (Reference 9). Additional information on hurricane history and damages, particularly for recent storms, comes from papers published in the Monthly Weather Review. The following lists significant storms affecting the panhandle in this century. Damage figures are those determined for values at the time of the storm. No attempt has been made to adjust these figures to present day values.

1917 (September 21 - September 29)

This storm made landfall near Fort Walton Beach with damage estimated at $270,000. Tide levels of 7.8 feet National Geodetic Vertical Datum of 1929 (NGVD) were recorded at Fort Barrancas, Florida.

1915 (August 31 - September 6)

This storm made landfall near Port St. Joe with the heaviest damage occurring to the east near Apalachicola, Florida. Damage was estimated to be $40,000. Tide levels of 7.0 feet NGVD were recorded at Carrabelle, Florida.

1924 (September 13 - September 19)

Crossing the shoreline near Port St. Joe, this storm caused damage estimated at $275,000. Winds of 80 mph were recorded at Panama City.

1929 (September 21 - October 4)

The center of this storm entered the coast near Panama City, Florida. Damage from the storm was estimated at $500,000.

BEST COPY AVAILABLE

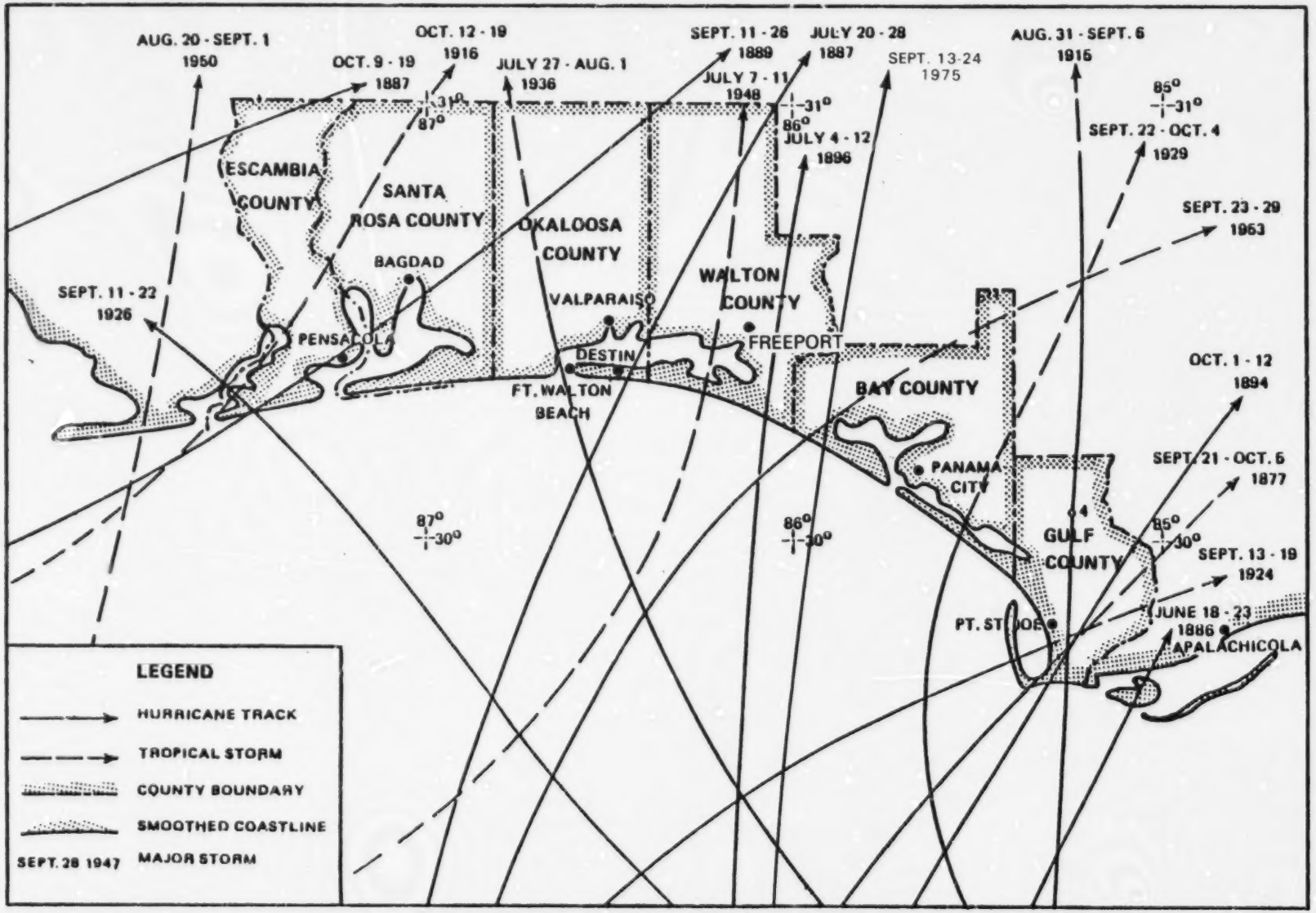


FIGURE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF FREEPORT, FL

(WALTON CO.)

HISTORICAL STORM TRACKS

WALTON COUNTY AND VICINITY

BEST COPY AVAILABLE

1936 (July 27 - August 1)

The center of this storm passed over Fort Walton Beach and Valparaiso. Damage was estimated at $150,000. Tide levels of 7 to 8 feet NGVD were recorded at Destin. A high-water mark of 8.4 feet NGVD was reported at Fort Walton Beach.

1950 Hurricane Baker (August 20 - September 1)

The center of this storm entered the coast between Pensacola, Florida, and Mobile, Alabama, with damage estimated at $550,000. Tide levels recorded during the passage of this storm include 4.5 feet NGVD at Pensacola and Carrabelle, 5 feet NGVD at Panama City, and 6.8 feet NGVD at Apalachicola.

1953 Hurricane Florence (September 23 - September 28)

This storm made landfall between Panama City and Fort Walton Beach with damage estimated at $150,000.

1956 Hurricane Flossy (September 21 - September 30)

This was a major hurricane that caused extensive damage along the Louisiana, Mississippi, and Alabama coasts. Total damage was estimated at $25 million. Tide levels of 5.5 feet NGVD were recorded at Fort Walton Beach. Tides at Destin were estimated at 6 to 7 feet NGVD.

1972 Hurricane Agnes (June 14 - June 22)

This storm made landfall near Panama City. Tide levels of 8 to 9 feet NGVD were recorded at several points from St. George Island to Panacea, Florida.

1975 Hurricane Eloise (September 13 - September 24)

This storm made landfall about 40 miles west of Panama City. High-water marks ranging from 10-18 feet NGVD were found between Destin and Port St. Joe. Residential damage was extensive, over $2.5 million in Walton County alone.

2.4 Flood Protection Measures

There are no extensive constructions for flood protection, although some of the new homes are being built with the first floor above the 100-year base flood elevation.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood

BEST COPY AVAILABLE

plain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Analyses were carried out to establish the peak elevation-frequency relationships for each flooding source studied in detail.

Inundation from Choctawhatchee Bay caused by passage of storms (storm surge) was determined by the joint probability method (Reference 10). The storm populations were described by probability distributions of 5 parameters that influence surge heights. These were central pressure depression (which measures the intensity of the storm), radius to maximum winds, forward speed of the storm, shoreline crossing point, and crossing angle. These characteristics were described statistically based on an analysis of observed storms in the vicinity of the City of Freeport. Primary sources of data for this were obtained from "Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States" (Reference 11) and "Meteorological Considerations Pertinent to Standard Project Hurricane, Atlantic and Gulf Coasts of the United States" (Reference 12) by NOAA. A summary of the parameters used for the area is presented in Table 1, Parameter Values for Surge Elevations.

For areas subject to flooding directly from Choctawhatchee Bay, the FEMA standard storm surge model was used to simulate the coastal surge generated by any chosen storm (that is, any combination of the 5 storm parameters defined previously). By performing such simulations for a large number of storms, each of known total probability, the frequency distribution of surge height can be established as a function of coastal location. These distributions incorporate the large-scale surge behavior, but do not include an analysis of the added effects associated with much finer scale wave phenomena, such as wave height or runup. As the final step in the calculations, the astronomic tide for the region is then statistically combined with the computed storm surge to yield recurrence intervals of total water level (Reference 13).

The storm-surge elevations for the 10-, 50-, 100-, and 500-year floods have been determined for Choctawhatchee Bay and are shown in Table 2, Summary of Stillwater Elevations. The analyses reported herein reflect the stillwater elevations due to tidal and wind setup effects, but do not include the contributions from wave action effects.

BEST COPY AVAILABLE

BEST COPY AVAILABLE

CENTRAL PRESSURE DEPRESSION (MILLIBARS)	15.2	24.2	33.2	38.2	49.2	60.2	75.2	79.2
ASSIGNED PROBABILITIES	0.32	0.27	0.06	0.11	0.09	0.08	0.05	0.02
STORM RADIUS TO MAXIMUM WINDS (NAUTICAL MILES)	12			24			36	
PROBABILITY	0.23			0.50			0.27	
FORWARD SPEED (KNOTS)	7			13			19	
PROBABILITIES: ENTERING	0.46			0.36			0.18	
DIRECTION OF STORM PATH (DEGREES FROM TRUE NORTH)		138	ENTERING	167		196		225
PROBABILITY		0.25		0.23		0.27		0.25
FREQUENCY OF STORM OCCURENCE (STORM/NAUTICAL MILE/YEAR)	0.002213							

TABLE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF FREEPORT, FL

(WALTON CO.)

PARAMETER VALUES FOR SURGE ELEVATIONS

FLOODING SOURCE AND LOCATION	TRANSECT	STILLWATER ELEVATION (FEET NGVD)			
		10% (10-YEAR)	2% (50-YEAR)	1% (100-YEAR)	0.2% (500-YEAR)
CHOCTAWHATCHEE BAY					
Along shoreline from Wheeler Point to LaGrange Bayou	N/A	3.9	6.7	7.8	9.5

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF FREEPORT, FL

(WALTON CO.)

SUMMARY OF STILLWATER ELEVATIONS

CHOCTAWHATCHEE BAY

BEST COPY AVAILABLE

3.2 Hydraulic Analyses

Hydraulic analyses, considering storm characteristics and the shoreline and bathymetric characteristics of the flooding sources studied, were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the shorelines.

The FEMA storm surge model was utilized to simulate the hydrodynamic behavior of the surge generated by the various synthetic storms. This model utilizes a grid pattern approximating the geographical features of the study area and the adjoining areas. Surges were computed utilizing grids of 5 statute miles and 1 statute mile, depending on the resolution required.

Underwater depths and land heights for the model grid systems were obtained from topographic mapping at a scale of 1:24000 with a contour interval of 5 feet (Reference 14).

All elevations are referenced to NGVD. Elevation reference marks used in this study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study produces maps designed to assist communities in developing flood plain management measures.

4.1 Flood Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for flood plain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each flooding source studied in detail, the 100- and 500-year flood boundaries have been delineated using U.S. Geological Survey topographic mapping (Reference 14).

For the streams studied by approximate methods, only the 100-year flood plain boundary was delineated using the Flood Hazard Boundary Map (Reference 15).

Flood plain boundaries are indicated on the Flood Insurance Rate Map. On this map, the 100-year flood plain boundary corresponds to the boundary of the areas of special flood hazards (Zone A, numbered A zones, and numbered V zones) and the 500-year flood plain boundary corresponds to the boundary of areas of moderate flood hazards (Zone B). In cases where the 100- and 500-year flood plain boundaries are close together, only the 100-year flood plain boundary has been shown. Small areas within the flood plain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

BEST COPY AVAILABLE

5.0 INSURANCE APPLICATION

To establish actuarial insurance rates, data from the engineering study must be transformed into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source studied in detail affecting the City of Freeport.

5.1 Reach Determinations

In coastal areas, reaches are limited to the distance for which the 100-year flood elevation does not vary more than 1.0 foot. The locations of these reaches are shown on the Flood Insurance Rate Map.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is used to establish relationships between depth and frequency of flooding in any reach. This relationship is then used with depth-damage relationships for various classes of structures to establish actuarial insurance rate tables.

The FHF for areas subject only to storm surge flooding is the difference between the 10- and 100-year stillwater elevations rounded to the nearest 0.5 foot, multiplied by 10, and shown as a 3-digit code. For areas with wave heights less than 3 feet, the FHF is the weighted average difference between the 100-year wave crest elevation and the 10-year stillwater elevation. For areas with wave heights greater than 3 feet, the FHF is determined using the difference between the 10- and 100-year stillwater elevations multiplied by 1.55, then rounded to the nearest 0.5 foot, multiplied by 10, and shown as a 3-digit code.

For example, if the difference between elevations is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference is greater than 10.0 feet, it is rounded to the nearest whole foot.

5.3 Flood Insurance Zones

Flood insurance zones and zone numbers are assigned based on the type of flood hazard and the FHF, respectively. A unique zone number is associated with each possible FHF and varies from 1 for a FHF of 005 to a maximum of 30 for a FHF of 200 or greater.

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations are shown or FHFs determined.
Zone A8:	Special Flood Hazard Areas inundated by the 100-year flood, with base flood elevations shown, and zones subdivided according to FHFs.

BEST COPY AVAILABLE

Zone B: Areas between Special Flood Hazard Areas and the limits of the 500-year flood; areas that are protected from the 100- and 500-year floods by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas of less than 1 square mile. Zone B is not subdivided.

Zone C: Areas of minimal flooding; not subdivided.

Flood elevation differences, FHFs, flood insurance zones, and base flood elevations for the flooding sources studied in detail in the community are shown in Table 3, Coastal Flood Insurance Zone Data.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of Freeport is, for insurance purposes, the principal product of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevations. For each flooding source, the expected water-surface elevations of the base (100-year) flood are shown as a weighted average within zones. Each whole-foot elevation is delineated except where cartographic considerations require the combination of two or more elevation zones. The base flood elevations and zone numbers are used by insurance agents, in conjunction with structure elevations and characteristics, to assign actuarial insurance rates to structures and contents insured under the National Flood Insurance Program.

6.0 OTHER STUDIES

A Type 19 Flood Insurance Study is in progress for the Unincorporated Areas of Walton County (Reference 1). The results of the Walton County study are in agreement with this study.

Due to its more detailed analysis, this Flood Insurance Study supersedes the previously printed Flood Hazard Boundary Map for the City of Freeport (Reference 15).

7.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, 1371 Peachtree Street, NE., Suite 736, Atlanta, Georgia 30309.

BEST COPY AVAILABLE

FLOODING SOURCE	TRANSECT	PANEL[1]	ELEVATION DIFFERENCE[2,3] BETWEEN 1.0% (100-YEAR) FLOOD AND 10% (10-YEAR)	FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3,4] (FEET NGVD)
CHOCTAWHATCHEE BAY	N/A	0005	−3.9	040	A8	8

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE IN FEET
[3]ROUNDED TO NEAREST FOOT
[4]DUE TO MAP SCALE LIMITATIONS, BASE FLOOD ELEVATIONS SHOWN ON MAP MAY REPRESENT AVERAGE ELEVATIONS FOR ZONES DEPICTED

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF FREEPORT, FL
(WALTON CO.)

COASTAL FLOOD INSURANCE ZONE DATA

CHOCTAWHATCHEE BAY

BEST COPY AVAILABLE

8.0 REFERENCES AND BIBLIOGRAPHY

1. Federal Emergency Management Agency, Type 19 Flood Insurance Study, Walton County, Unincorporated Areas, Florida, in progress.

2. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Florida, Washington, D.C., February 1982.

3. Stottler Stagg & Associates, Inc., for the U.S. Army Corps of Engineers, Mobile District, Development of Flood Damage Reduction Measures in a 16-County Area, August 1977.

4. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Tropical Cyclones of the North Atlantic Ocean, 1871-1977, June 1978.

5. U.S. Army Corps of Engineers, Mobile District, Report on Hurricane Survey of Northwest Florida Coast, Mobile, Alabama, December 1964.

6. ————, Flood Plain Information - Vicinity of Pensacola, Escambia, and Santa Rosa Counties, Florida, June 1972.

7. Garriott, E.D., "The West Indian Hurricanes of September 1906," Monthly Weather Review, 1906, Volume 34.

8. Sumner, Howard C., "Hurricanes of October 3-12 and Tropical Disturbance of October 18-21, 1941," Monthly Weather Review, 1941, Volume 69.

9. Patterson, J.L., J.F. Bailey, and J.L.H. Paulhus, "Hurricane Agnes Rainfall and Floods, June-July 1972," U.S. Geological Survey Professional Paper 924, U.S. Geological Survey, Washington, D.C.

10. U.S. Department of Commerce, Environmental Sciences Services Administration, Technical Memorandum WBTM Hydro 11, Joint Probability Method of Tide Frequency Analysis Applied to Atlantic City and Long Beach Island, New Jersey, Vance A. Myers, April 1970.

11. ————, National Oceanic and Atmospheric Administration, Technical Report NWS 15, Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States, Frances P. Ho, Richard W. Schwerdt, and Hugo V. Goodyear, May 1975.

12. ————, National Hurricane Project, Report No. 33, Meteorological Considerations Pertinent to Standard Project Hurricane, Atlantic and Gulf Coasts of the United States, Howard E. Graham, Dwight E. Nunn, November 1959.

13. Tetra Tech, Inc., Coastal Flooding Storm Surge Model, Parts 1 and 2, Methodology, prepared for the Federal Emergency Management Agency, 1981.

BEST COPY AVAILABLE

14. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 5 feet: Freeport, Florida, 1970; photorevised, 1976.

15. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Freeport, Florida, October 1976.

BEST COPY AVAILABLE